

ADOLF APPELLÖF, who died at Upsala on January 5, was born on the island of Gottland on November 2, 1857. In 1889 he became a conservator of the zoological collections in Bergens Museum, and succeeded to the keepership of the whole department in 1907, being at the same time made professor at the newly established university there. In 1910 he was appointed professor of comparative anatomy at Upsala, which post he held until the end. In his early writings on Cephalopoda, Appellöf showed that similarly hectocotylised arms arose in diverse groups; he threw light on the homologies of the shell in Sepia, Spirula, and Nautilus, and proved the occurrence of a shell in the octopods. Among many works on actinians, that on their development (1900) won for him the Nansen prize. Later he studied the Crustacea, wrote an important work on the decapods of Norway, and won the Joachim Friele gold medal with a memoir on the lobster. Two papers on Pycnogonids of the Arctic should not be forgotten. Such were Appellöf's chief publications; but he did a large amount of investigation into fishery and other zoological problems in expeditions along the Norwegian coast and, on the *Michael Sars*, to the North Sea and North Atlantic. His chief work, however, was the inspiring instruction of youth in the laboratory at Bergen, and later at Upsala and in the biological station of "The Club," which he founded five years ago on Gullmar Fjord. There, among the living sea-creatures and the merry students, Appellöf's cheerful enthusiasm found its untrammelled exercise.

F. A. B.

THE death of MR. HERBERT BYROM RANSOM is announced in *Engineering* for March 11. Mr. Ransom was born in 1867, and was educated at Cheltenham College, and passed through the

engineering course at University College, London. He received his practical training with Messrs. Manlove, Alliott, and Co., Ltd., Nottingham, and became a director of the company in 1902. In 1908 he retired to take up private practice. He was a member of the Institutions of Civil and Mechanical Engineers, and his papers to the former institution were awarded a Miller prize and scholarship, a Watt medal, and a Telford premium.

THE death is reported, in his eighty-third year, of DR. CHARLES H. FERNALD, professor of natural history at the Maine State College (now the University of Maine) from 1871 to 1886, and of zoology and entomology at the Massachusetts Agricultural College from 1886 to 1910. When the Hatch experiment station was established at the latter institution Dr. Fernald became the entomologist of the station. He had contributed largely to scientific journals, and in collaboration with Mr. E. H. Forbush prepared a large work on "The Gypsy Moth," which was published by the State. He was the father of Dr. H. T. Fernald, the present head of the entomological department at the Massachusetts Agricultural College.

THE death of SIR ARTHUR LEWIS WEBB on March 15 is announced in the *Engineer* for March 18. Sir Arthur was born in 1860, and entered the irrigation branch of the Public Works Department of India in 1881, after having passed through the Royal Engineering College at Coopers Hill. He was transferred to the Egyptian Irrigation Department in 1894, and rose to be Under-Secretary for Irrigation and Adviser to the Public Works Ministry. He was created K.C.M.G. in 1912.

Notes.

FOR the meeting of the British Association which will be held at Edinburgh on September 7-14 next the following presidents of Sections have been appointed:—Section A (Mathematics and Physics), Prof. O. W. Richardson; B (Chemistry), Dr. M. O. Forster; C (Geology), Dr. J. S. Flett; D (Zoology), Mr. E. S. Goodrich; E (Geography), Dr. D. G. Hogarth; F (Economics), Mr. W. L. Hitchens; G (Engineering), Prof. A. H. Gibson; H (Anthropology), Sir J. Frazer; I (Physiology), Sir W. Morley Fletcher; J (Psychology), Prof. C. Lloyd Morgan; K (Botany), Dr. D. H. Scott; L (Education), Sir W. H. Hadow; and M (Agriculture), Mr. C. S. Orwin. Sir Richard Gregory has been appointed president of the Conference of Delegates of Corresponding Societies. Among the subjects of general interest which are being arranged for discussion at joint sectional meetings are:—The Age of the Earth, Biochemistry, Vocational Training and Tests, The Relation of Genetics to Agriculture, The Proposed Mid-Scotland Canal, and The Origin of the Scottish

People. The president of the association, Sir Edward Thorpe, will deliver his address at the inaugural meeting on Wednesday evening, September 7, and discourses will be given at general evening meetings by Prof. C. E. Inglis on The Evolution of Cantilever Bridge Construction, involving a comparison between the Forth and Quebec bridges, and by Prof. W. A. Herdman, the present president, on Edinburgh and Oceanography. Measures are being taken towards a more effective co-ordination of the daily programmes in order to avoid the clashing of subjects of kindred interest.

THE SECRETARY FOR MINES has appointed Dr. F. H. Hatch to be Technical Adviser to the Mines Department on questions relating to the metalliferous mining industry.

SIR EDWARD THORPE (Great Britain), Prof. Le Chatelier (France), Prof. Ciamician (Italy), and Dr. Ernest Solvay (Belgium) have been elected honorary foreign members of the Chemists' Club, New York.

THE annual Wilbur Wright lecture of the Royal Aeronautical Society for this year is to be delivered by Major G. I. Taylor at the Royal Society of Arts on Tuesday, April 12, at 8 o'clock.

It is announced in *Science* for March 4 that the Bruce gold medal for the year 1921 of the Astronomical Society of the Pacific has been awarded to Dr. H. A. Deslandres, director of the Astrophysical Observatory of Meudon, near Paris, for his "distinguished services to astronomy."

THE International Institute of Anthropology, which has been founded at Paris, will hold a congress at Liège on July 25-August 1. The provisional programme appears in the current issue of the *Revue Anthropologique*, which has been adopted as the organ of the institute and of the Schools of Anthropology of Paris and of Liège. The central office of the institute is at 15 rue de l'Ecole de Médecine, Paris VI.

At the anniversary meeting of the Royal Irish Academy on March 16 Prof. Sydney Young was elected president in succession to the Most Rev. Dr. Bernard, Provost of Trinity College, Dublin, whose period of office has just expired. Prof. C. S. Sherrington, president of the Royal Society, was declared an honorary member in the section of science under the statute by which presidents of the Royal Society are honorary members of the academy.

THE summer meeting of the Institution of Electrical Engineers is to be held in Scotland on June 7-10, and a provisional programme for it has just been issued. Besides a number of visits to places of interest, the reading of the two following papers has been arranged for:—"The Dalmarnock Generating Station," R. B. Mitchell (at the Royal Technical College, Glasgow, on June 7), and "The Hydro-electric Resources of the Scottish Highlands," Prof. Magnus Maclean (in Glasgow University on June 8).

At the meeting of the Royal Geographical Society on Monday, March 21, the president announced that the King has sent a donation of 100l. towards the funds of the Mount Everest Expedition. The president added:—"Both his Majesty and her Majesty the Queen take the greatest interest in the expedition, and have questioned me closely as to our plans, the prospects of success, and the composition of the party; and they have assured me of the keen interest with which they will follow the progress of the expedition."

THE election to a Sorby research fellowship at the University of Sheffield will take place in June next. The appointment, subject to regulations, will be for five years, and the emoluments approximately 500l. per annum. The object of the fellowship is not the training of men for original research, but to obtain advances in natural knowledge by enabling men of proved ability to devote themselves to research. Applications for the fellowship should be made to the Secretaries of the Royal Society, Burlington House, W.1, by May 31, and such applications should give particulars of the candidate's scientific career and state the nature of the work he proposes to follow if elected.

At the annual general meeting of the Ray Society on March 10 the following officers were re-elected:—*President*: Prof. W. C. McIntosh *Treasurer*: Sir Sidney F. Harmer. *Secretary*: Dr. W. T. Calman. The Right Hon. Lord Rothschild was elected a vice-president, and Mr. E. E. Green, Mr. Chas. Oldham, and Sir David Prain were elected new members of council. The report of the council directed attention to the urgent need for a large increase in the number of subscribers if the society is to avoid the alternatives of raising the rate of subscription or restricting the annual output of publications. It was announced that the first part of the fourth volume of Prof. McIntosh's "British Marine Annelids" was in the press, and would form the issue to subscribers for 1920. Substantial grants towards the cost of publication of this work have been made by the Carnegie Trust for the Universities of Scotland and by the Royal Society.

A SECOND International Congress of Eugenics is to be held in New York City on September 22-28, under the honorary presidency of Dr. Alexander Graham Bell. The president of the congress is Prof. Henry Fairfield Osborn, its treasurer Mr. Madison Grant, hon. secretary Mrs. C. Neville Rolfe (of London), and general secretary Dr. C. C. Little. The papers to be read before the congress fall into four sections:—(1) Studies in human heredity, including the results of research in pure genetics which may be applicable to man. (2) The human family, including the factors that influence the fecundity of different strains and the differential mortality of the eugenically superior and inferior stocks; mate selection to be considered in this section. (3) Human racial differences; in this section will be considered the facts of migrations and the influences of racial characteristics on human history and miscegenation. (4) Applied eugenics; here will be discussed eugenics in relation to the State, to society, and to education. It is desired that all papers from Europe should be in the hands of the general secretary, Dr. C. C. Little, American Museum of Natural History, by May 1, and those from Canada and the United States not later than June 15. Persons having material for exhibition are requested to write at once to Dr. Little, stating its nature and size.

THE annual general meeting of the Chemical Society was held at Burlington House on March 17, when Sir James J. Dobbie, the retiring president, delivered his address. The following new officers and members of council were declared elected:—*President*: Sir James Walker. *Vice-Presidents who have filled the office of President*: Prof. H. E. Armstrong, Sir James J. Dobbie, Prof. W. H. Perkin, Sir William J. Pope, Dr. Alexander Scott, and Sir William A. Tilden. *Other Vice-Presidents*: Prof. F. G. Hopkins, Prof. F. S. Kipping, and Prof. J. F. Thorpe. *Ordinary Members of Council*: Prof. J. S. S. Brame, Dr. C. H. Desch, Mr. E. V. Evans, Mr. H. B. Hartley, Dr. T. S. Patterson, Dr. T. Slater Price, Mr. W. Rintoul, Dr. R. Robinson, and Dr. N. V. Sidgwick. In presenting the Longstaff medal to Prof. J. F. Thorpe the president referred to the importance of the researches on organic chemistry on which Prof. Thorpe and his colleagues had been engaged for many years. The

anniversary dinner was held at the Hotel Cecil the same evening, and was attended by more than two hundred fellows and guests. Sir James J. Dobbie was in the chair. Of the five jubilee past-presidents whom the council desired to entertain as guests of honour only Sir James Dewar and Sir William Tilden were able to be present. After the loyal toasts had been honoured Sir Alfred Mond gave the toast of "The Chemical Society," to which the president replied. The toast of "The Past-Presidents" was proposed by Prof. Harold B. Dixon, and response made by Sir James Dewar and Sir William A. Tilden; whilst Prof. C. Moureu (vice-president of the French Chemical Society), the Hon. Mr. Justice Sargant, and Prof. C. S. Sherrington (president of the Royal Society) replied to the toast of "The Guests," proposed by Prof. F. G. Donnan.

AN Appointments Committee for Russian Scientific and Literary Men has been formed under the chairmanship of Sir Arthur Schuster, among other members being Lord Bryce, Sir Frederic Kenyon, and Prof. Sherrington, president of the Royal Society. Numbers of distinguished Russian scholars, many of whom are destitute, while others are engaged in work for which they are unfitted, are scattered over European countries. It is the object of the committee to bring the names and qualifications of these men to the notice of universities and other institutions which may be able to offer them suitable employment. A list of names of those at present known to the committee has been received, and in it we notice the following:—Assistant-Prof. Vladimir Issaieff, technical chemistry (sugar and fermentation industries); Prof. Anatole Poppen, ophthalmology (specialist in trachoma); Prof. Lazar Rosenthal, bacteriology; Prof. Vadim Yurevich, bacteriology and infectious diseases; Assistant-Prof. Jacob Khlitchieff, naval engineering and shipbuilding; Assistant-Prof. Nicholas Znamensky, applied mechanics; Dr. Leonid Dubitzky, hygiene; Dr. Nicholas Hans, philosophy and psychology; Dr. Boris Perrot, hygiene and tuberculosis; Dr. Serge Chakhotin, zoology and physiology; Dr. Ernest Ferman, hygiene; and Dr. Boris Sokoloff, protozoology. The hon. secretary to the committee is Dr. C. J. Martin, Director, Lister Institute, London, S.W.1, and he will be glad to forward particulars of the careers of the men whose names are given above, or copies of the circular letter inviting anyone who knows of spheres of work in which they could be engaged to communicate with him. Opportunities for providing these stranded scientific workers with positions where their knowledge and experience could be usefully employed must arise from time to time in university and other institutions, and any assistance in bringing information of such possible openings to the notice of the committee would be gratefully welcomed.

AMONG many savage or barbaric races the belief in the dangers which occur in the course of house-building is widely felt. A good account of this is given in a paper by Dr. G. Landman in *Acta Academiae Aboensis*, part i., in relation to the Papuan Kiwai tribe, inhabiting the district at the mouth of

the Fly River in British New Guinea. At present the people can give no exact explanation of the Darimo, or protective figures of the house. They do not seem to represent any definite being or beings. "The gloomy aspect of the figures and the uncanny, if indistinct, ideas associated with them exercise in themselves a powerful effect upon the native mind without any exact interpretation being required. It is enough for the people that the weird forms are possessed of mysterious properties, partly their own and partly those of the medicines applied to them."

THE study of the aborigines of Tasmania will be much advanced by the publication of a descriptive catalogue, prepared by Messrs. W. L. Crowther and C. E. Lord, of the osteological specimens contained in the Tasmanian Museum. The list forms a record of the largest single collection extant of osteological remains of the extinct Tasmanian aboriginal race. It embraces also specimens concerning which data are being gathered for publication, while additional particulars have been added to specimens already in part described. With the exception of the researches of Harper and Clarke, and later of Berry and Robertson, on certain of the crania contained in this list, none of the specimens have been described. Even the complete skeleton of Trucanini, the last of his race, remains to be measured and the indices to be tabulated. Some further specimens in private hands have been traced, and anthropologists will await with interest the completed results of the investigation.

IN an interesting review (*Journal of Genetics*, vol. x., No. 4) of the sex-ratios and the various ways in which they have been modified in animals and plants, Mr. Julian S. Huxley discusses the relations of modified sex-ratios to the sex-chromosomes, and adopts the probable hypothesis that in many such cases the normal effect of the presence of one or two X-chromosomes has been overridden by a metabolic effect of some environmental factor. This factor may be delayed fertilisation (producing in frogs chiefly males, and also altering the sex-ratio in cattle), attack of the anthers by a smut in the plant *Lychnis dioica* causing the partial transformation of male plants into hermaphrodites, development of females from male crabs by parasitic castration, and in cattle the partial alteration of a female into a male when twinned with a male owing to the circulation in the blood of substances derived from the male embryo (Lillie). In all such cases the normal effect of the chromosome complex in development has been modified probably by the metabolic influence of substances not present in normal conditions. A similar interpretation is applied to the experiments of Goldschmidt and of Harrison with moths and of Riddle with pigeons. It is pointed out that aberrant sex-ratios may result from differential fertilisation, differential mortality of gametes or zygotes, or the overriding of the chromosome constitution by such external factors as those mentioned. This view is applied to an explanation of a case in the "millions fish" (*Girardinus poeciloides*), where there was first a great preponderance of males, then a lesser preponderance of females, and finally equality in the numbers of the sexes.

THE Scaphopoda (tusk shells) of the eastern coast of America have received careful systematic treatment by Mr. J. B. Henderson, whose account (U.S. Nat. Mus., Bull. 111, 1920) is based on the extensive collection in the United States National Museum and in other museums, and on several hundred lots from his own dredgings in the Florida Keys. The species appear to fall into two well-marked groups—a northern cold-water group extending from New England to Cape Hatteras, and having affinities with the species of northern Europe, and an Antillean assemblage.

MAJOR W. S. PATTON contributes to the *Indian Journal of Medical Research* (vol. vii., No. 4, 1920) an account of the Mesopotamian house-flies and their allies, and describes the measures against them which he adopted in the camp at Nasiriyeh, on the Euphrates. The principal means were:—(1) Incineration of manure and excrement to destroy the eggs and larvæ of flies; (2) the burying of fresh manure in the centre of a mound of manure previously accumulated and in which the temperature, owing to fermentation, was already high enough to kill eggs and larvæ—a method originally employed in France by Roubaud and now “thoroughly recommended” for a tropical climate by Major Patton after his experience of its usefulness in Mesopotamia; (3) the drowning of larvæ and pupæ; (4) the use of baited traps to catch adult flies; and (5) the burning at dusk of large numbers of flies which had congregated in the interior of huts erected at suitable points to serve as resting-places for the flies. Kerosene torches were passed rapidly over the walls and roofs of these huts for this purpose.

A LECTURE by Mr. W. B. Brierley on “Personal Impressions of American Biological Research” was given on Tuesday, March 15, at a meeting held at the Imperial College, South Kensington, by the National Union of Scientific Workers. Sir Daniel Hall occupied the chair. Mr. Brierley said that the most striking feature of American agriculture was the almost complete concentration in wide areas of a single crop, so that there were 500 miles together of maize, cotton, or rice, and not much smaller areas of fruit or vegetables for preserving. One consequence of this was that a plant disease ran riot through a whole area, and the field problems confronting the American agricultural biologist were so vast and menacing as almost to destroy the possibility of academic research except in the eastern industrial regions. In the industrial area, containing the older universities, the biological work approximated closely to that done in this country in subject and mode of attack, but in the State universities in the newer agricultural regions—each with its own single crop presenting urgent problems for solution—certain features were noticeable:—(1) An early and extreme specialisation, subjects which were here studied after a degree course in botany (such as plant pathology) being themselves degree courses, and the graduates immediately devoting themselves exclusively to the study of a single type of disease. (2) There was almost no gradation between the academic biologist

of real eminence and the ordinary worker dealing with a limited field of applied science.

THE United States Geological Survey has just issued a monograph (Professional Paper 96) on “The Geology and Ore Deposits of Ely, Nevada,” by Mr. Arthur C. Spencer. This work is notable as giving a very complete account of the occurrences of disseminated copper ore usually spoken of as the porphyry copper deposits. Their importance may be gauged from the fact that, although work upon them only commenced in 1908, in the period between then and 1915 nearly 20,000,000 tons of this ore had been treated, producing nearly 200,000 tons of copper, whilst some 95,000,000 tons of ore have been developed. The ore consists for the most part of monzonite porphyry of various types; true monzonite is a plutonic rock containing about equal amounts of orthoclase and plagioclase, together with hornblende, augite, or mica. The greater part of the monzonite in the Ely district is of the variety known as quartz monzonite, intermediate between granite and granodiorite. This rock appears to carry a certain quantity of primary copper minerals, chiefly chalcocite, in quantities sufficient to give about 0.5 per cent. of copper in the unaltered rock. The portions worked as ore have later undergone secondary enrichment; the copper has been leached out from the overlying parts until these contain only about 0.2 per cent. of copper, the leached zone extending to a depth varying between 20 ft. and 200 ft. The cupriferous solutions descending from these upper portions were decomposed lower down, depositing chalcocite and some additional chalcocite, thus bringing the copper contents of the workable portion up to 1.5 or 2 per cent.; the thickness of the zone thus enriched appears to be about 300 ft. in most parts. The mode in which these changes have probably been brought about has been carefully studied, and is described in full detail, and the work forms a valuable contribution to our knowledge of ore deposition.

MESSRS. NEGRETTI AND ZAMBRA have designed and produced an instrument called a rainfall rate recorder which registers on a revolving drum a graph of the actual rate of rainfall at any moment in inches per hour. The principle involves weighing the water as it passes down an inclined surface. The inclined surface is a tube in the shape of a spiral, and is suspended at one end of a balanced lever, the other end of which carries the pen. The spacing of the recording scale is more open for the lower than for the higher intensities. The instrument is capable of being made of great use, especially for engineers concerned with main drainage and similar works. An examination of the records obtained suggests that the initial record of a rainfall is fallacious, drops accumulating in the tube and starting with a record much higher than is true, whilst the curve at the end of a rainfall is similarly fallacious owing to drops remaining in the tube. These objections are far from trifling, and require to be got rid of before the instrument is really trustworthy, though when rain is falling heavily the changes in the rate of fall are

very clearly shown. The price of the instrument, with the necessary charts and plant, is 55*l*.

THE *Meteorological Magazine* for January contains a communication from Sir Napier Shaw concerning the possibility of dissipating fog by artificial heating, the subject having been suggested to him by an inquirer who alleged that he "had seen fog disperse over a football ground as the game proceeded." Sir Napier Shaw is clearly very dubious of the possibility of dissipating fog artificially, especially as in a fog the air is in motion and not absolutely still, as is generally supposed. A preliminary survey of the rainfall of 1920 is given; it is said to be divided into two well-marked periods, the first seven months being generally wet and the five later months generally dry. The total for the year was above the average in the west, but there was a deficiency along the east coast of Great Britain. The greatest excess was in Wales, where in places the total was 30 per cent. above the average. For the British Isles as a whole the rainfall in 1920 is estimated as 109 per cent. of the average. The Thames Valley rainfall map for December shows the greatest rainfall during that month to have occurred in the southern areas, in parts of Hampshire and Sussex, where it exceeded 4 in., whilst in the north, around Cambridge, the rainfall was 1.5 in. or less.

A PAPER by Prof. Gabriel Petit published in *La Nature* of October 16, 1920, gives an interesting account of the effect of radio-activity on the fertility of the soil. From the results of experiments on geraniums, chrysanthemums, etc., the author concludes that there is no doubt that radio-active substances exert a very favourable influence on the growth of plants. The experiments show that the treatment is harmful if the radio-active substance is present in too great quantity. Researches are therefore being continued in different parts of the country to decide on the optimum dose and on the best method of application; to discover which of the three kinds of rays—the α , β , or γ —are the most valuable, and whether the rays act on the plant directly or indirectly *via* the soil or *via* the micro-organisms in the soil; and, finally, to decide whether radio-activity has any influence on nitrogen fixation. It is clear that there is an almost unlimited field for experiments, and, in the author's opinion, there will undoubtedly be a great gain for agriculture from the scientific application of radio-active substances.

At the meeting of the Illuminating Engineering Society on March 17 Major A. Garrard read a paper entitled "Motor-car Headlights: Ideal Requirements and Practical Solutions." It was pointed out that the problem involves a compromise between two almost irreconcilable points of view, that of the driver of a car who requires a powerful beam impinging on distant persons and vehicles and that of approaching persons or drivers of other vehicles who are apt to be dazzled by the intense light of such a beam. On the whole, the best practical solution appears to lie in keeping all light below the eye-level, at the same time giving maximum intensity just below the boundary. Several headlights in which an attempt was made to realise this condition were shown at the

meeting. The lecturer suggested that the ideal beam should consist of (1) a bright, penetrating part, very shallow and relatively wide, projected along the road surface below eye-level; (2) a much wider beam, not so bright, illuminating hedges, etc., also all below eye-level; and (3) a generally diffused beam of very low intensity close to the car. He contended that these requirements cannot be met by any simple device or attachment to the ordinary parabolic headlamp, but only by some form of optical projecting apparatus employing at least one lens, which should not be materially more complex or expensive than the headlight of the present day.

THE *Bulletin de la Société d'encouragement pour l'Industrie nationale* for January contains the complete text of the public lecture given by Lt.-Col. Renard in February, 1920, on "The Evolution of Aeronautics during the War." Col. Renard points out that while in the war of 1870-71 the ordinary balloon played an important part, in the recent war its utility was insignificant. On the other hand, the captive balloon, which had been scrapped as out of date by the French military authorities in 1911, was used by the Germans from the very beginning of the war as a means of observation. Before the end of the war captive balloons of 800 to 1000 cubic metres capacity were in constant use. In the same way the development of the dirigible had only reached the stage represented by a volume of 8000 cubic metres in France in 1914, while in Germany Zeppelins of three times that volume had been constructed. The aeroplane had, on the contrary, been developed in France with enthusiasm, and speeds of 120 km. per hour attained. During the war this speed was doubled. Col. Renard urges on his country the importance of developing civil aviation as the best preparation for the next war, which he believes will open by the aerial bombardment of all the principal cities of one of the belligerents.

THE March issue of the *Philosophical Magazine* contains an article by Sir J. J. Thomson on the structure of the molecule and chemical combination, which collects together and amplifies the statements the author has made in his Royal Institution lectures during the past few years. He points out that the nuclear atom with revolving electrons is unstable, and replaces it by a positive nucleus with electrons in equilibrium around it, the equilibrium being secured by the law of action of nucleus and electron being taken as an attraction according to the inverse square of the distance at considerable distances, but as a repulsion at small distances. In these circumstances it is shown that one electron arranges itself at the distance from the nucleus at which attraction changes to repulsion, two arrange themselves on opposite sides of the nucleus, three at the corners of an equilateral triangle, four at the corners of a tetrahedron, and so on up to eight electrons, which arrange themselves in regular order on the surface of a sphere with the nucleus at the centre. When there are more than eight electrons, the first eight form an inner, and the rest an outer, layer, the number of the latter determining the valency of the atom. The properties of the atoms and molecules which are accounted for on this theory are numerous, and the theory seems most fertile.

AN important paper on the "corona voltmeter" was read to the American Institute of Electrical Engineers last July by Prof. J. B. Whitehead, of Johns Hopkins University. The principle on which the voltmeter is founded is that a corona forms on a clean, round wire in air at a sharply marked definite value of the voltage dependent only on the pressure and temperature of the air. The voltage at which the corona forms can be observed directly by the eye or by the deflection of a galvanometer in the high-tension circuit, or best by the sound made in a telephone. The wire on which the corona forms is in a chamber the pressure of the air in which can be varied. This instrument gives a higher accuracy than that obtainable by a sphere-gap voltmeter, and the presence of neighbouring conductors does not affect its readings. An instrument on this principle to read 100,000 volts can easily be constructed in any electrical laboratory. The author is making one to read 400,000 volts. In experimenting with these voltmeters on alternating pressures a curious physical law was discovered. If R denotes the maximum potential gradient in kilovolts per cm., and r the radius of the wire in cm., then at 25° C. and 76 cm. pressure the value of R at which the corona appears is given by $R = 29.84 + 9.938/\sqrt{r}$, provided that $1/\sqrt{r}$ is less than 2.26; but if the value of $1/\sqrt{r}$ is greater than 2.26, $R = 32.96 + 8.559/\sqrt{r}$. The reason given as

an explanation of this sudden change in the law is that the laws governing the formation of the positive and negative coronas found with direct voltages are slightly different.

IN addition to a large amount of useful statistical information in a paper on fuel oil read by Mr. W. A. White before the North-East Coast Institution of Engineers and Shipbuilders on January 28, there is a section in which the advantages of fuel oil over coal are enumerated for power purposes at sea. Fuel oil lends itself more easily to complete combustion than any solid fuel; owing to the higher heating value there is a saving in dead-weight, and increased space may be devoted to cargo; the conditions governing the speed of the ship are better, and there is economy regarding the necessary crew. In relation to the last-mentioned point, the *Aquitania* while burning coal had a staff of 350 men in connection with the stokeholds, and now on fuel oil this vessel requires some 84 men only. For bunkering the *Aquitania* has four fuel-receiving lines, and 480 tons per hour have been pumped into her bunkers from one barge through one pipeline; the total quantity of fuel required for her round trip could easily be delivered into the bunkers in six hours. Before conversion to oil-burning the *Aquitania* and the *Olympic* each took about 108 hours at each end for coal-bunkering, and employed 50 to 60 men; oil-bunkering employs 3 men only.

Our Astronomical Column.

NEW COMET 1921a.—A comet of the 9th magnitude was discovered by Mr. Reid at the Cape Observatory on March 13. The following observations have been received:

G.M.T.			R.A.			S. Decl.			Place
d.	h.	m.	h.	m.	s.	h.	m.	s.	
March 14	14	51.0	20	14	35.0	18	28	48	Johannesburg
"	18	16 49.7	20	16	56.7	16	20	40	Algiers

Deduced daily motion $+35s.$, N. $31\frac{1}{2}'$. Predicted place March 25d. 16h., R.A. 20h. 21m., S. declination $12^{\circ} 41'$. The comet will rise on that day about $2\frac{3}{4}$ h. before sunrise. It cannot be identical with comet Pons-Winnecke, for the latter passes its ascending node near aphelion, whereas the new comet passed its ascending node about noon on March 12.

Careful search has been made for Pons-Winnecke by several observers without success. Either the comet is unexpectedly faint or it is a long way from the predicted place.

RE-APPEARANCE OF SATURN'S RING.—The *Comptes rendus* of the Paris Academy of Sciences for February 28 contains the observations of this phenomenon made at Strasbourg by MM. A. Danjon and G. Rougier. The smaller equatorial (aperture 16 cm.) was employed. From February 11 to 21 no trace of the ring was visible outside the disc; its shadow on the disc appeared as a black line 0.2" broad.

On February 22, at 9h. G.M.T., the ring was seen as a very narrow bright line with condensations distant 18.2" and 13.8" from the centre of the disc, being strongest on the eastern side. These measures, and the others in the article, are reduced to the mean distance of Saturn from the sun. The visibility of the ring increased perceptibly during the four hours of observation, and on the following night it was quite an easy object. Making use of Barnard's measures of the ring system, the authors show that the condensations measured by them were respectively a

little inside the middle of ring A, and about one-fourth of the width of ring B outside its inner edge. They are not the same as those measured by Barnard in 1907, which were on the outer part of ring B and on the crêpe ring.

The position angle of the ring was measured on February 22; the value found was $85^{\circ} 14'$, which is $7'$ less than the Nautical Almanac value. Measures of Saturn's disc gave for the equatorial diameter 17.65", and for the polar one 15.75"; compression, 1/9.3. It is interesting to note that the equatorial horizontal parallaxes of the sun from the earth and Saturn are practically identical.

The ring will be edgewise to the sun on April 10; after that its dark side will again be turned towards the earth until August 3, when the third passage through the ring plane will take place.

BRAZILIAN NATIONAL OBSERVATORY ANNUAL.—The *Anuario pelo Observatorio Nacional do Rio de Janeiro* for 1921 contains the usual astronomical data, together with expanded refraction tables and a very extensive list of useful constants. There are a full description, with diagrams, of the various wireless time signals, and an essay on the calendar, describing the various suggestions that have lately been put forward for eliminating the inconveniences of the present system.

The magnetic elements for a large number of Brazilian stations are given. Those for Rio de Janeiro are tabulated at twenty-year intervals from 1660 onwards and compared with various formulæ. The latest formula for magnetic declination is that due to Dr. Morize, the present National Astronomer, viz. $5.6^{\circ} + 0.08^{\circ}t + 8.0^{\circ}\sin(0.63^{\circ}t - 44.1)$, t being reckoned in years from 1850. The largest residual of this formula is 0.44° in 1760. The sine-term has a period of 571 years.

Tide tables for nine Brazilian ports complete the volume.